Superfund Research Program

The Superfund Research Program (SRP) supports practical research that creates benefits, such as lower environmental cleanup costs and reduced risk of exposure to hazardous substances, to improve human health. SRP funds colleges, universities, and small businesses, including the University of Iowa Superfund Research Program (ISRP), to advance this work across the nation.

Research Highlights

Partnering to reduce PCB exposures

ISRP researchers have launched a partnership to clean up polychlorinated biphenyls (PCBs) using phytoremediation, a process in which plants are used to contain, degrade, or eliminate contaminants from soils and water.[1] Working with the town of Altavista, Virginia, and Ecolotree Inc., a small business focusing on phytoremediation, scientists are using poplar trees to reduce exposures from a PCB-contaminated lagoon. They are also studying the processes that influence PCB containment and detoxification by the poplar trees, with the goal of minimizing airborne exposures and reducing health risks to the community.[2] Craig Just, Ph.D., and David Osterberg are helping coordinate efforts to implement this plan as a low-cost and sustainable approach.

Poplar trees were planted on test plots next to a lagoon to reduce PCB contamination. (Photo courtesy of ISRP)

Finding ways plants can help clean contaminated soil and groundwater

Researchers have found that switchgrass may help safely remove PCBs from the environment.

Researchers led by Jerald Schnoor, Ph.D., have shown that a combination of specific types of bacteria and switchgrass plants growing together remove up to 47 percent of PCBs from contaminated soils.[3] PCBs are a family of chemical compounds that had been widely used in industrial applications and still persist in the environment in air, water, soil, and foods. PCB exposure can lead to severe skin rashes, liver damage, cancer, and other adverse health effects.[4] The combination of bacteria and plants, such as switchgrass and poplar trees, has potential to be a powerful solution for cleaning up PCB-contaminated soils and sediments, and holds promise as a sustainable, cost-effective method that may be less disruptive than traditional cleanup methods.

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Researchers at ISRP are working to better understand how PCBs move through the environment via water, air, and other pathways, and how they affect human health. Their goal is to reduce exposures and prevent adverse health effects.

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Measuring airborne exposures to PCBs

Peter Thorne, Ph.D., and his research team found that schools in a research study area had much higher indoor PCB concentrations than students' homes, and accounted for the majority of the children's inhalation exposures.[5] The analysis compared groups of children and their mothers living in urban East Chicago, Indiana, and in rural Columbus Junction, Iowa. The Indiana site has a history of industrial activity that created polluted canals that are currently undergoing dredging, which may release PCBs into the air. ISRP researchers are further studying the children's PCB exposures in more detail. For example, Thorne's team is measuring what proportion comes from air versus diet. They are also defining mathematical relationships between PCBs in air and levels in blood. Very few studies have examined airborne exposures, so work to examine this pathway is critical to understanding the health effects of PCBs.

The importance of studying PCBs

- People are exposed to PCBs through eating or drinking contaminated food, inhalation, and skin contact.[4]
- Although the manufacturing of PCBs was stopped in 1977, PCBs do not readily break down, and can remain in the environment for long periods of time. PCBs are also found in dyes and paints as byproducts of manufacturing.[4,6]

Research overview

- Identifying sources and fate of airborne PCBs.
  (Keri Hornbuckle, Ph.D., keri-hornbuckle@uiowa.edu)
- Measuring exposure to airborne PCBs in mothers and their children.
  (Peter Thorne, Ph.D., peter-thorne@uiowa.edu)
- Investigating PCB-induced cell damage and ways to prevent cellular toxicity.
  (Prabhat Goswami, Ph.D., prabhat-goswami@uiowa.edu)
- Studying toxic effects of PCB metabolites.
  (Michael Duffel, Ph.D., michael-duffel@uiowa.edu)
- Determining how airborne PCBs lead to gene damage, cancer, and other health effects.
  (Larry Robertson, Ph.D., larry-robertson@uiowa.edu)
- Investigating how plants can be used to clean up PCBs at contaminated sites.
  (Jerald Schnoor, Ph.D., jerald-schnoor@uiowa.edu)

Sharing results

- ISRP brings together scientists and community advisory boards from Iowa, Illinois, and Indiana to address environmental concerns about PCBs, provide educational programs at schools, and share research findings with communities. (David Osterberg, david-osterberg@uiowa.edu)

Other contributions to advance science

- The ISRP research support facilities provide vital access to expertise, research resources, and state-of-the-art instrumentation for its research projects. (Keri Hornbuckle, Ph.D., keri-hornbuckle@uiowa.edu; Peter Thorne, Ph.D., peter-thorne@uiowa.edu; Hans-Joachim Lehmler, Ph.D., hans-joachim-lehmler@uiowa.edu)
- The ISRP integrated, multidisciplinary training experience provides early-career scientists access to teams of diverse professionals, and encourages innovation to develop solution-oriented approaches to complex environmental health problems.
  (Gabriele Ludewig, Ph.D., gabriele-ludewig@uiowa.edu)

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For more information on the National Institute of Environmental Health Sciences, visit **www.niehs.nih.gov**.

For more information on the Superfund Research Program, visit **www.niehs.nih.gov/srp**.

For more information on the University of Iowa Superfund Research Program, visit **http://iowasuperfund.uiowa.edu**.

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